In September 2001, a leak evaluation of the AY Farm raw water system over the tank structures was performed (RPP-8887, *Evaluation of Potential Water Intrusion Sources*). It was concluded that raw water supply valves were leaking into the raw water valve pits, which are open-bottomed and filled with gravel and vermiculite. The raw water supply valves for Tanks AY-101 and AY-102 were replaced with blind flanges. Inspection of the raw water piping excavated for the leak evaluation noted that the nearby abandoned 1 ½-in. carbon steel steam condensate piping was heavily corroded, as documented in the 1980s. The corrosion appeared to be typical for the 200 Areas caused by carbon pipe in contact with soil and accelerated by the increased temperature of the steam condensate (Rockwell International internal letter 65950-81-466). The condensate lines were removed from service and capped at the valve pits. Inspection of the 4-in. coated raw water supply line showed no signs of degradation. In June 2006, the raw water header was cut and capped outside of AY Farm (RPP-RPT-37440; ECN-723915).

Corrosion product was collected from the annulus side of the primary tank wall of Tank AY-102 through Riser 80 in February 2003 (RPP-15758, *Analysis of Corrosion Product Retrieved From The Primary Tank Wall in the Annulus of Tank 241-AY-102*). The sample was scanned by Operational Health Physics and found to contain no radioactivity. Three types of analyses were performed: energy dispersive X-ray spectrometry (EDS), XRD, and wet chemical analysis. The analyses indicated that the steel was wetted with water resulting in aqueous corrosion. The likely cause was ingress of water from an external source combined with the shutdown of the annulus ventilation system for an extended period of time as reported previously (RPP-15758).

During the FY2006 annulus visual inspections of Tanks AY-101 and AY-102, rust streaks and mineralization were observed on the outside surface of the primary tank walls. During this time, annulus video examinations were expanded from four to eight risers in the Tank AY-102 annulus. For Tank AY-102, comparisons of the FY2006 videos with those taken in FY2001 showed that the size of the rust areas had increased, and were concentrated on the primary tank top knuckle region. The rust appeared most significant in areas where the primary and secondary liner walls converged, appearing to originate at the flashing-covered convergence between the primary and secondary liner walls. White and the yellow mineralization was reported in this location (Engeman and Rodgers 2007; CH2M-PER-2007-0086).

It is likely that soil channels created by the now isolated raw water supply leaks or the annulus ductwork may provide a path for rainfall and snowmelt seepage onto the concrete dome of the tank where it eventually finds its way to the metal dome of the primary tank. Ingress through the abandoned annulus ventilation piping (ductwork) could provide additional pathways. The water ingress once it penetrates through the concrete could travel under the 18 gauge metal flashing covering the gap where the primary and secondary liner walls converge and present itself as primary tank dome mineralization.

If the annulus ventilation system is turned off, it is possible for condensation to accumulate whenever the dew point of the incoming air is higher than the tank wall temperature. The condensate generated during these periods would also contribute to the rust.

Operating specification OSD-T-151-00007 requires that upon detection of water ingress into a DST annulus, either the water ingress be stopped within 30 days or a recovery plan be prepared and the intrusion stopped in accordance with the recovery plan.